MORPHEUS AG
INSPIRING MEDICAL TECHNOLOGY

Rebellion

The Innovative BoneBlade!

Rebellion

THE ULTIMATE BONE REMOVAL SYSTEM

MORPHEUS AG
INSPIRING MEDICAL TECHNOLOGY

FEATURES

STERILE

ANATOMICAL COMFORT-HANDLE (PAT. PEND.)

SAFELY COLLECTS BONE MATERIAL (PAT. PEND.)

ALWAYS SHARP PRECISE UNDERCUTTING (PAT.

BENEFITS

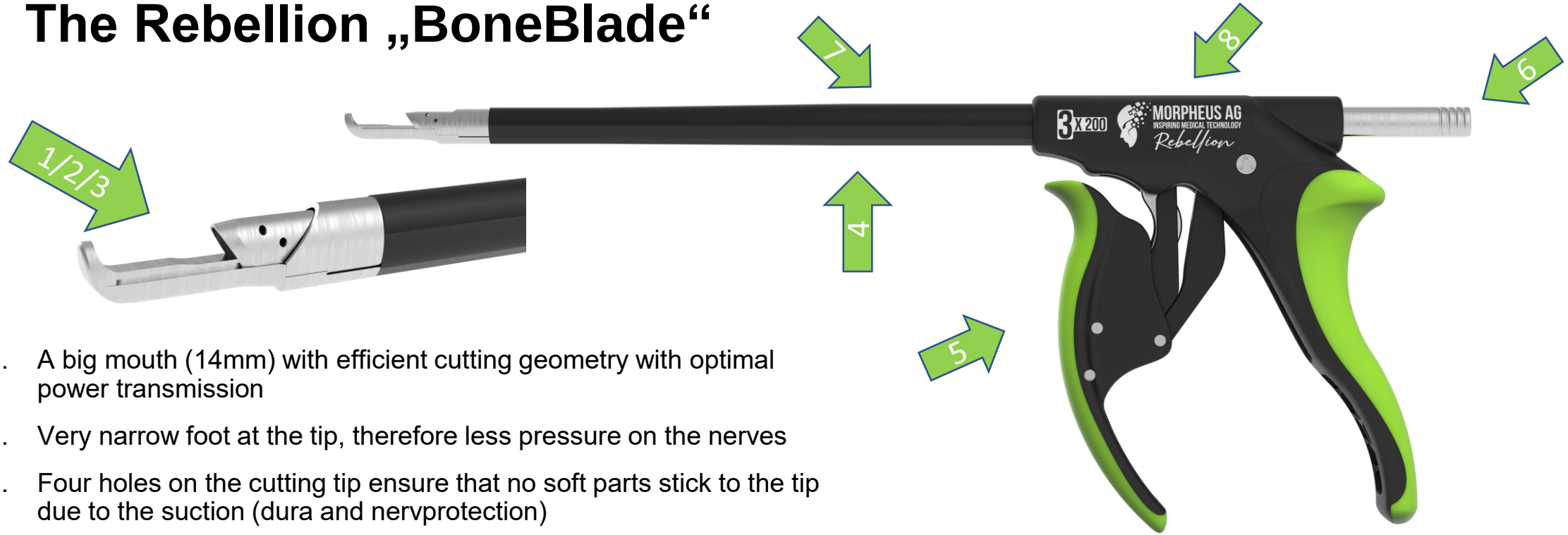
ORIGINAL BONE STRUCTURE

SURGEON STAYS FOCUSED ON THE OR-

SAVINGS IN OR-TIME AND RESSOURCES

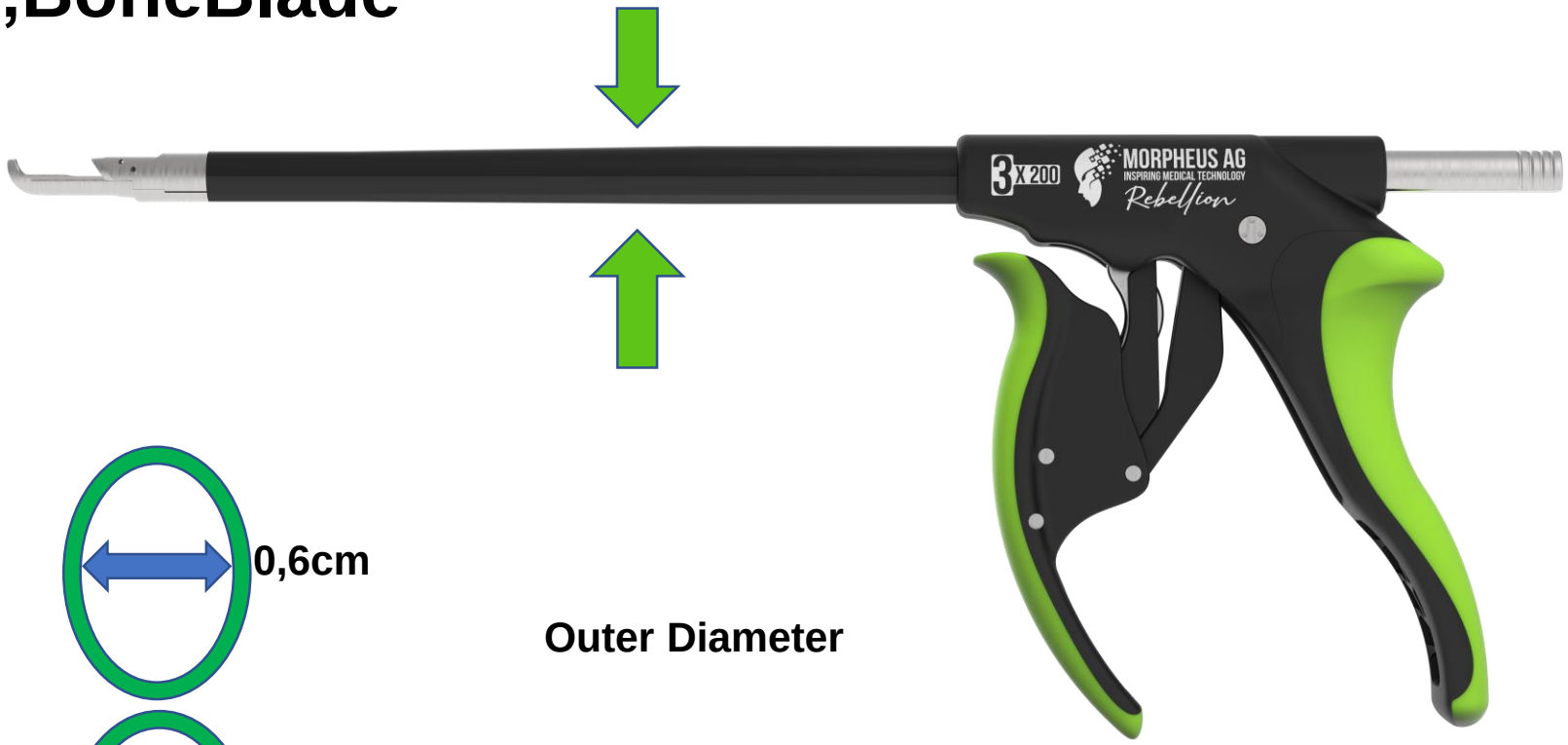
NO TIME LOSS FROM EJECTING BONE

The Rebellion „BoneBlade“



1. A big mouth (14mm) with efficient cutting geometry with optimal power transmission
2. Very narrow foot at the tip, therefore less pressure on the nerves
3. Four holes on the cutting tip ensure that no soft parts stick to the tip due to the suction (dura and nervprotection)
4. Two lengths and three jaw sizes available: length 200 (and 250 mm) / size 2,3,4
5. Ergonomic handle for optimal power transmission and against rapid fatigue of the surgeon's hand
6. Connection to the surgical suction or to the bone collector
7. Pipe-in-pipe guide for optimal power transmission
8. Easily readable size labeling

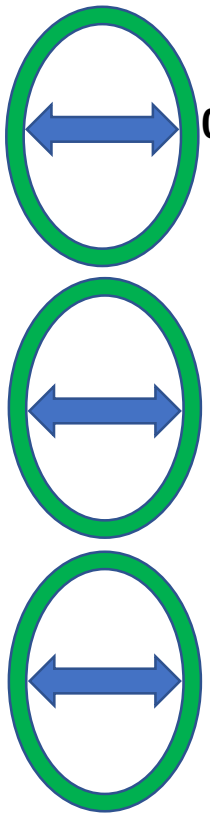
Rebellion - „BoneBlade“



Size 2: 0,9cm

Size 3: 1,0cm

Size 4: 1,1cm

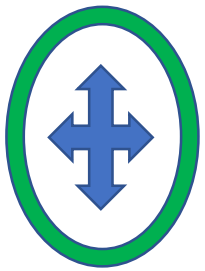


0,6cm

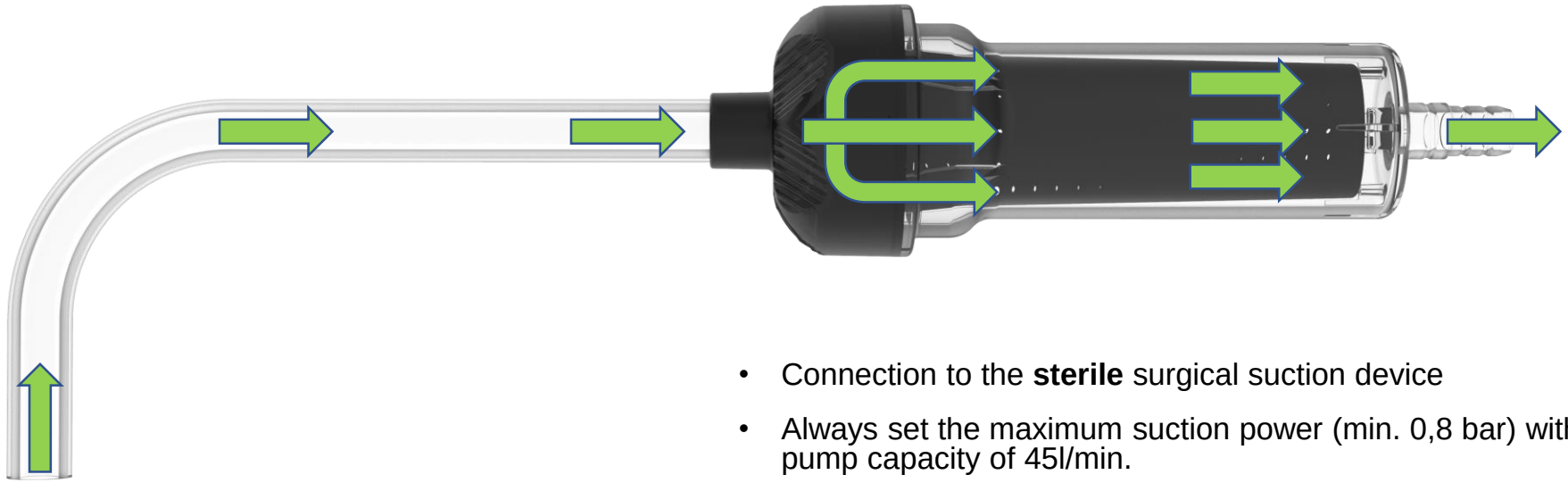
0,7cm

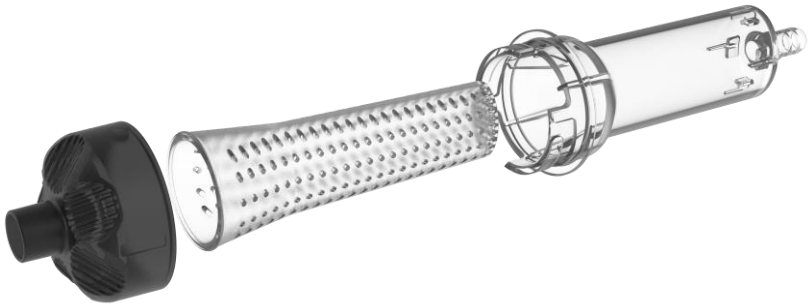
0,8cm

Outer Diameter



Bone Collector





- Connection to the **sterile** surgical suction device
- Always set the maximum suction power (min. 0,8 bar) with a minimum pump capacity of 45l/min.
- Pieces of bone are fed into the collector with the suction flow and collected there
- No suction loss by diverting the suction flow around the collector (green arrows)
- Bone collector holds 160 ml of bone material
- The tube length between the bone collector and Rebellion is 100cm
- Bone material can be returned to the patient at any time during the surgery

Rebellion - the new innovative suckerpunch!

Further development of a Kerrison punch that has practically not been adapted to today's standard in the past decades.

Rebellion

Why a single-use product?

- always available +
- always sharp +
- always sterile + (easier surgery planning!)
- no costs through sterilization +
- no water contamination by cleaning +
- no risk of infection due to the sterilization process
- no personnel expenditure due to processing, sorting, etc. +
- Resources are conserved because no multiple sets are required + (you only open what you need)

Standard Kerrison Punch

- must always be chemically cleaned and sterilized (cleaning result often not optimal) -
- cleaning chemicals must be disposed seperately –
- Possibly additional ultrasonic cleaning -
- permanent maintenance required (sharpen, oiling, check mechanics / repair) -
- will not be as sharp after each sharpening process as before -
- wear increases after every grinding process -
- material loss – gab between shoe and blade becomes bigger after each process -

Difference between Rebellion and a standard Kerrison Punch

Rebellion

- special cutting geometry enables cleaner cutting and precise punching +
- immediate extraction of the cut material +
- clear view of the surgical field +
- no need to leave the surgical field to hand over material to the surgical nurse +
  - great advantage when using microscope
  - thereby lower risk of infection for the patient
  - Surgical nurses have time for other tasks
- less risk for the patient due to easier handling +
- faster, more accurate work +
- optimal ergonomics for fatigue-free use and less weight +
- Collection of the material in a sterile environment or direct suction of the material +

Standard Kerrison Punch

- By blunt punching, "tearing out" the bone fragments -
- no precise guidance possible -
- lengthy punching process -
- Leaving the operating field again and again to collect material outside the operating field by the surgical nurse -
- higher risk for the patient -
- Working on the bone takes longer and cannot be carried out as precisely (for example undercut) -
- longer usage of the punch, hand fatigue due to non-ergonomic shape - high risk for surgeons of carpal tunnel syndrome – approx. 60 grams heavier -
- Requires unnecessarily high strength (tested: at least 4 times higher) since bone material has to be compressed and teared out -

Difference between Rebellion and a standard Kerrison Punch

Rebellion

Standard Kerrison Punch

- The caught bone material in the bone collector is of higher quality than the conventional one because it has not been compressed (cell & structure maintenance) – that means better bone ingrowth +
- No preparatory work with the drill is necessary, since the punch cuts much better, more precisely, faster and more clean +
- This also avoids aerosols
- Less mental stress
- Doctor's statement: "I save between 15-30 minutes * at a 2-hour surgery and can also save a drill (one drill head 100$!“) +
- Tumor tissue does not come into contact with healthy tissue through suction.

**Time can vary with another user.*

Cycle Standard Kerrison Punch

1. Procurement
2. Cleaning / Desinfection
3. Control
3.a. possibly repair /disposal
4. Documentation
5. Pack & Sterilize
6. Procurement (logistics & storage)
7. OR deployment
8. Use
9. Transport / Logistics

Cycle Rebellion

~~1.-Procurement~~

~~2. Cleaning / Desinfection~~

~~3.-Control~~

~~3.a. possibly repair~~

~~4. Documentation~~

~~5. Pack & Sterilize~~

6. Procurement (logistics & storage)

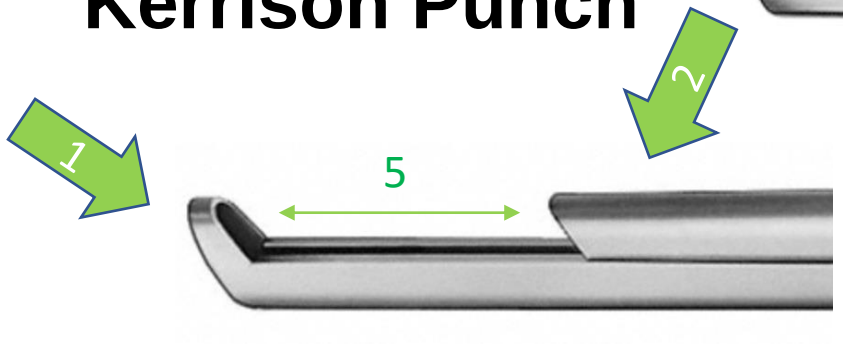
7. OR deployment

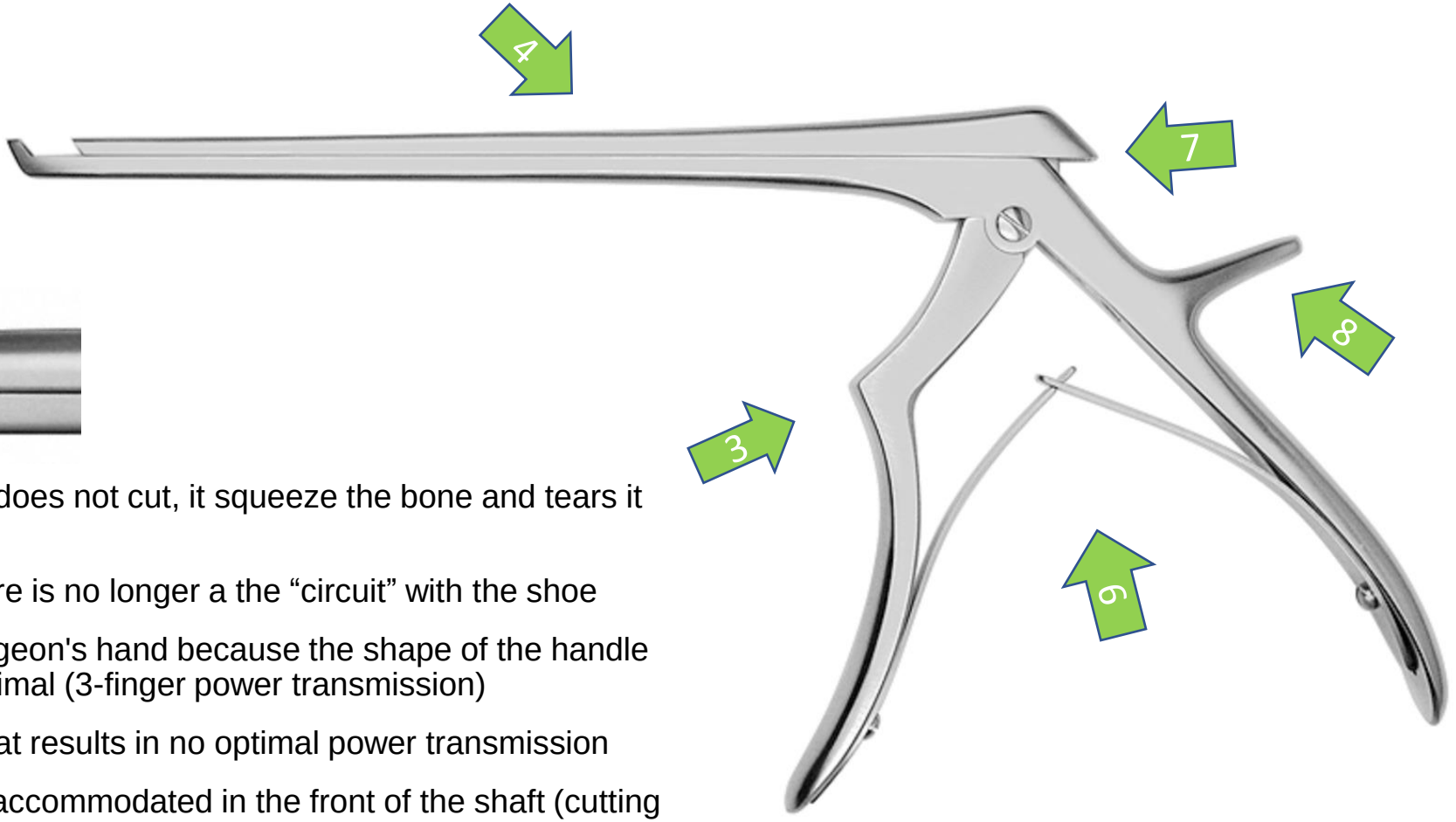
8. Use

~~9. Transport / Logistics~~

9. Disposal

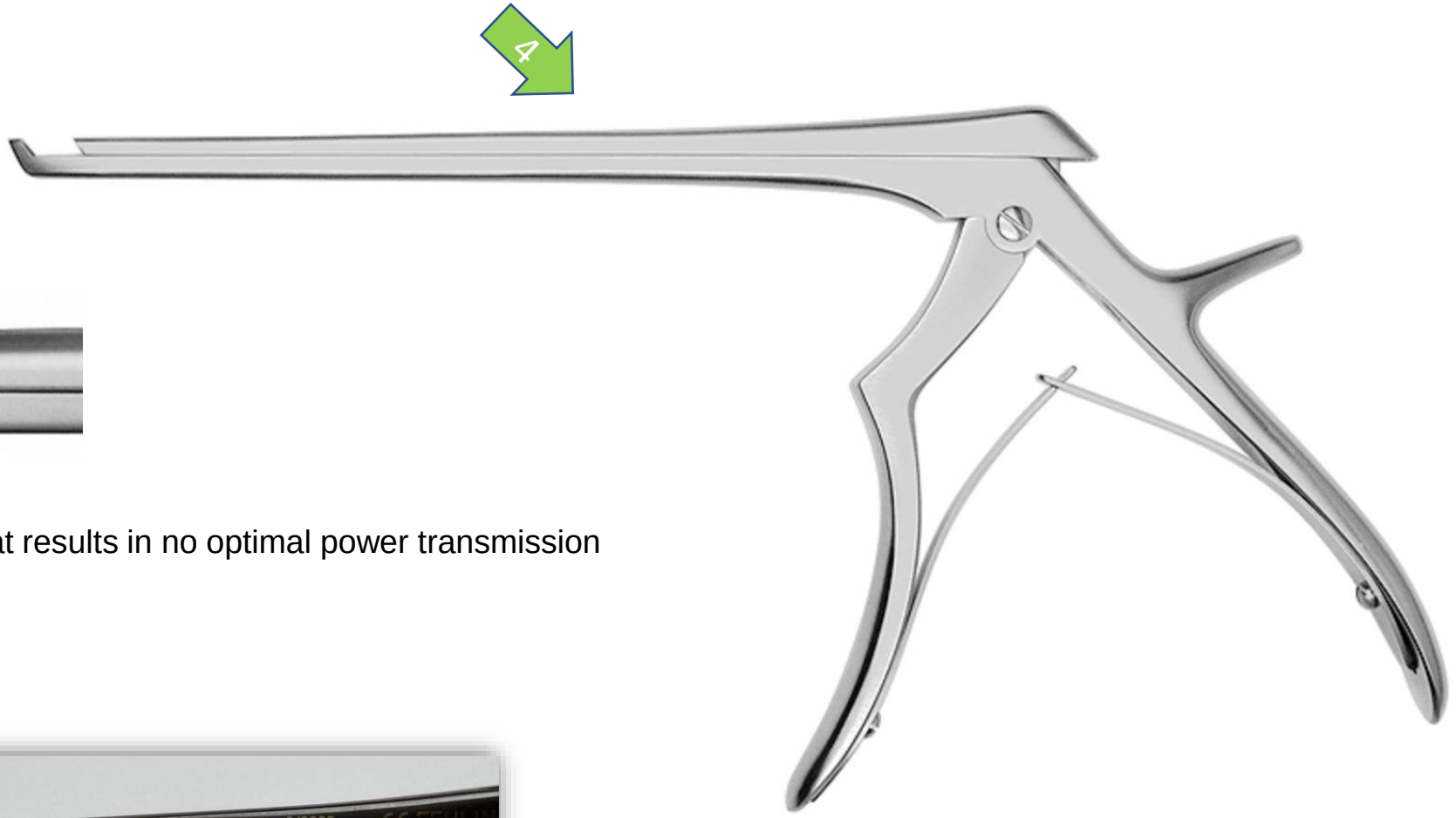
Kerrison Punch





1. Due to geometry of the sled the punch does not cut, it squeeze the bone and tears it off
2. If the tip is sharpened (more often), there is no longer a the “circuit” with the shoe
3. Signs of fatigue often appear in the surgeon's hand because the shape of the handle and the power transmission are not optimal (3-finger power transmission)
4. The sled can show a burst of force – that results in no optimal power transmission
5. The punched bone material cannot be accommodated in the front of the shaft (cutting not possible)
6. Increased risk of pinching or scratching the glove
7. Often difficult to clean, so contaminated residues remain on the instrument
8. The abutment causes pain with long use

Kerrison Punch



4. The sled can show a burst of force – that results in no optimal power transmission

Rebellion Bone Comparison

Kerrison Size 3

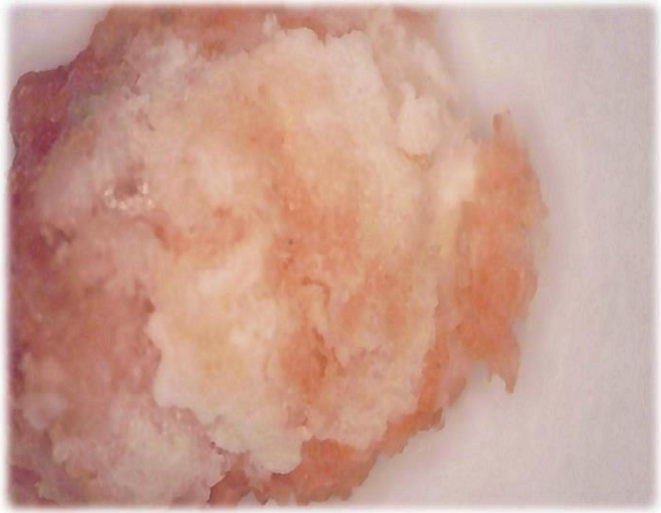
Rebellion Size 3

Rebellion Bone Comparison

Microscopic View:

Rebellion Kerrison

Kerrison: The bony structure is compressed



Rebellion: The bony structure is intact

Economical effort

Rebellion

- Cost per piece: 000.00 Dollar
- Cost for collector: 000.00 Dollar
- Time saving per surgery: 5-30 minutes (depending on the type of indication)
- 1 minute of surgery costs approx. 000.00 - 000.00 Dollar*
- No investment in sets and containers
- Possible elimination of drill

** costs can vary from house to house*

Standard Kerrison Punch

- Cost per piece: 000.00 - 000.00 Dollar (multiple punches) plus acquisition costs for containers and baskets plus subsequent costs for sterile filters and sterile seals
- Sterilize: approx. 00.00 Dollar per set *
- at least 2 sets per operating room required (for steri in the house, otherwise more)
- Sharpening: between 000.00 - 000.00 Dollar per sharpening cycle *
- More comprehensive documentation required due to MDA
- Drill for 00.00 - 00.00 Dollar per piece

- ** can vary from house to house*

Evidence of injuries / damage to the surgical gloves

Standard Kerrison Punch

Clinical Papers Promoting Safety & the HBC

- *"How often does glove perforation occur in surgery? Comparison between single gloves and a double-gloving system."*
- *"Incidence of glove failure during orthopedi operations and the protective effect of double gloves."*
- *"Intraoperative glove perforation–single versus double gloving in protection against skin contamination."*

OR Setting

Rebellion

1

Connect the Rebellion suction punch with the following components:

1. Connect the (sterile) surgical suction device (pump) to the punch or to the bone collector to suck off the punched material

Rebellion

Tipps ´n Tricks

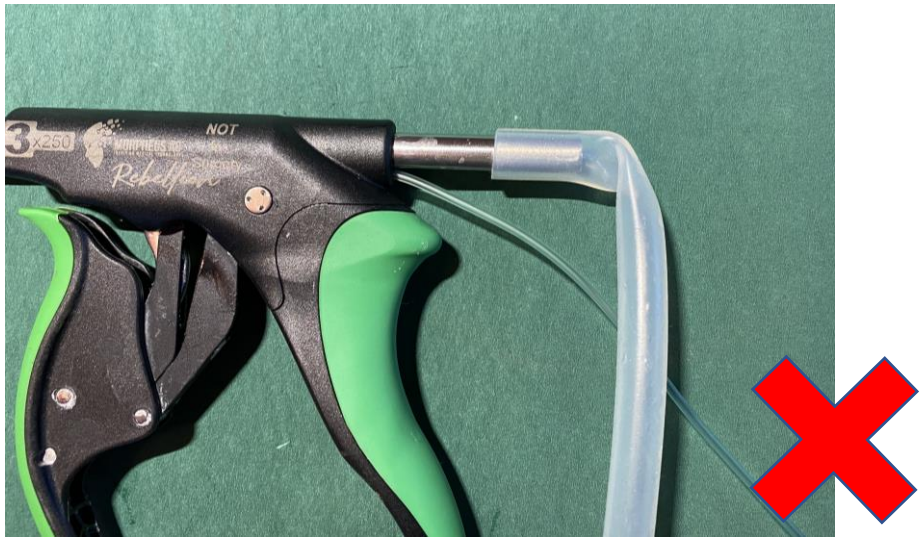
Rebellion

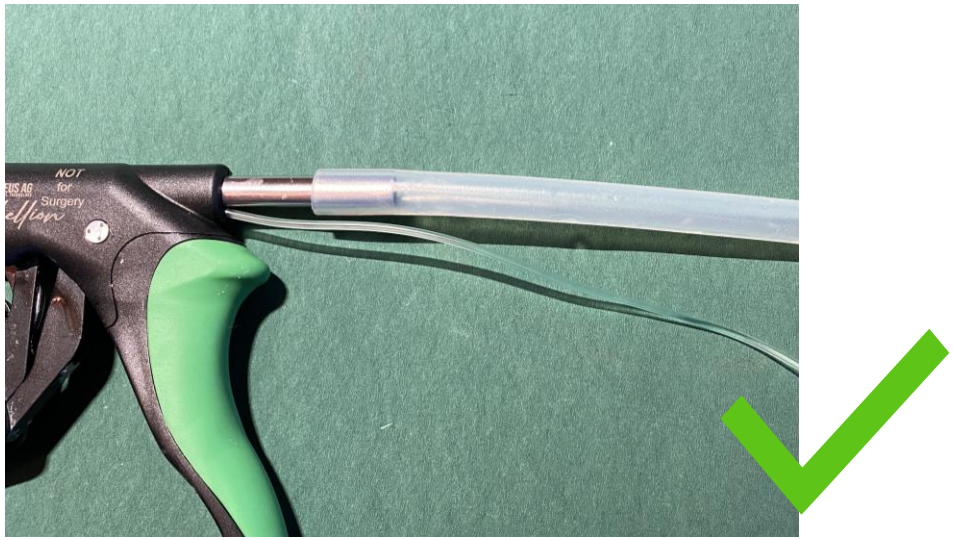
1. Do not push the suction tube too far (3cm max.) onto the tailpipe provided - otherwise it locks during punch process

Tipps ´n Tricks

Rebellion

2. To avoid clogging prevent the suction tube from kinking (position the collector on the patient or stick it to OR-Table)





Tipps ´n Tricks

Rebellion

3. Always set the maximum suction power (min. 0,8 bar) with a minimum pump capacity of 45l/min.

Tipps ´n Tricks

Rebellion

4. In case of soft tissue punching continue punching the bone to ensure that the solid material will „carry“ the soft tissue pieces as well to the collector

Tipps ´n Tricks

Rebellion

5. Finish the punching process to ensure that the material is cleanly cut and will not teared off – do not twist and turn!

Tipps ´n Tricks

Rebellion

6. To ensure proper function of the punch aspirate liquid (blood or Nacl 0,9) to guarantee drainage

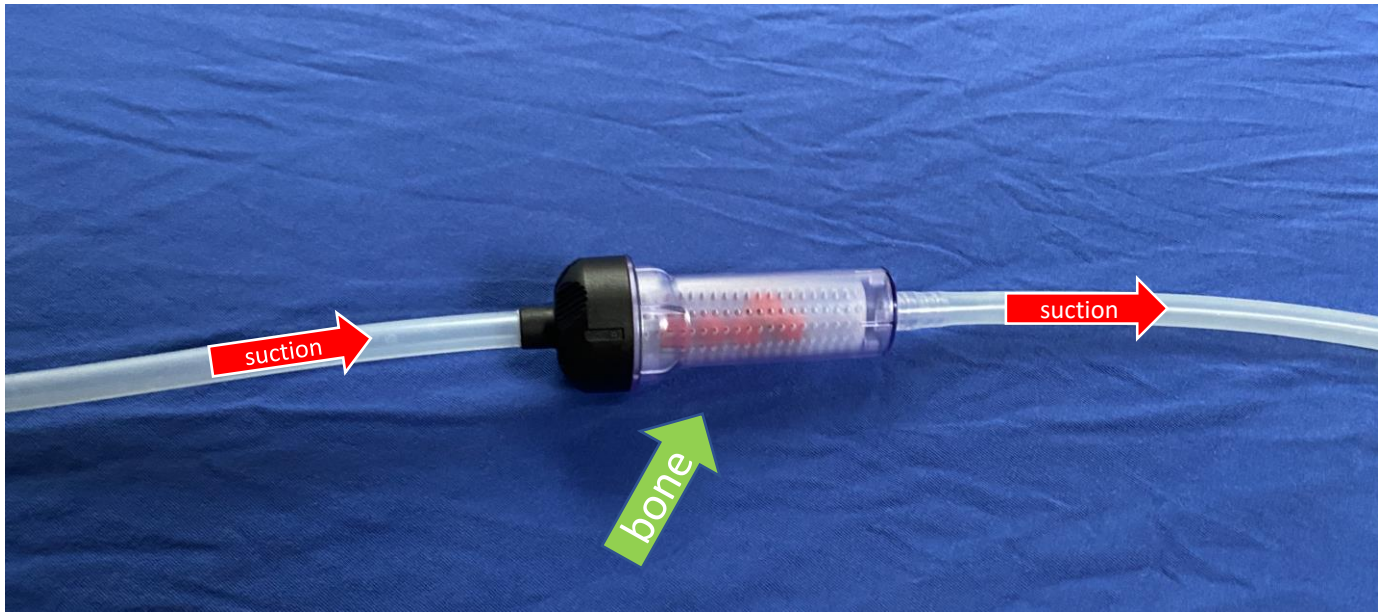
Tipps ´n Tricks Summary

Rebellion

1. Do not push the suction tube too far (3cm max.) onto the tailpipe provided - otherwise it locks during punch process
2. To avoid clogging prevent the suction tube from kinking (position the collector on the patient or sticking to OR-Table)
3. Always set the maximum suction power (min. 0,8 bar) with a minimum pump capacity of 45l/min.
4. In case of soft tissue punching continue punching the bones again so that the solid material "takes" the soft tissues with it
5. Finish punching to ensure that the material is cleanly cut and not teared off – do not twist and turn!!
6. To ensure proper function of the punch aspirate liquid to guarantee drainage

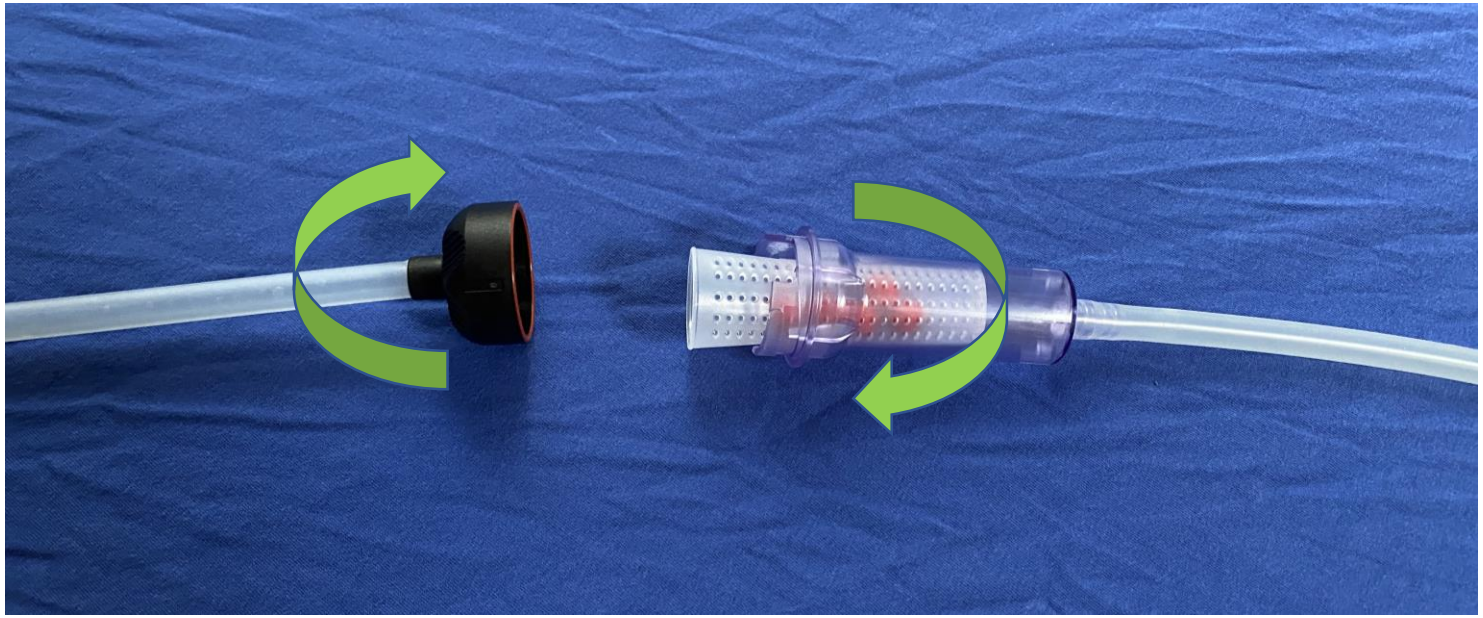
Bone Collector

The removed bones or soft tissues are collected in the bone collector



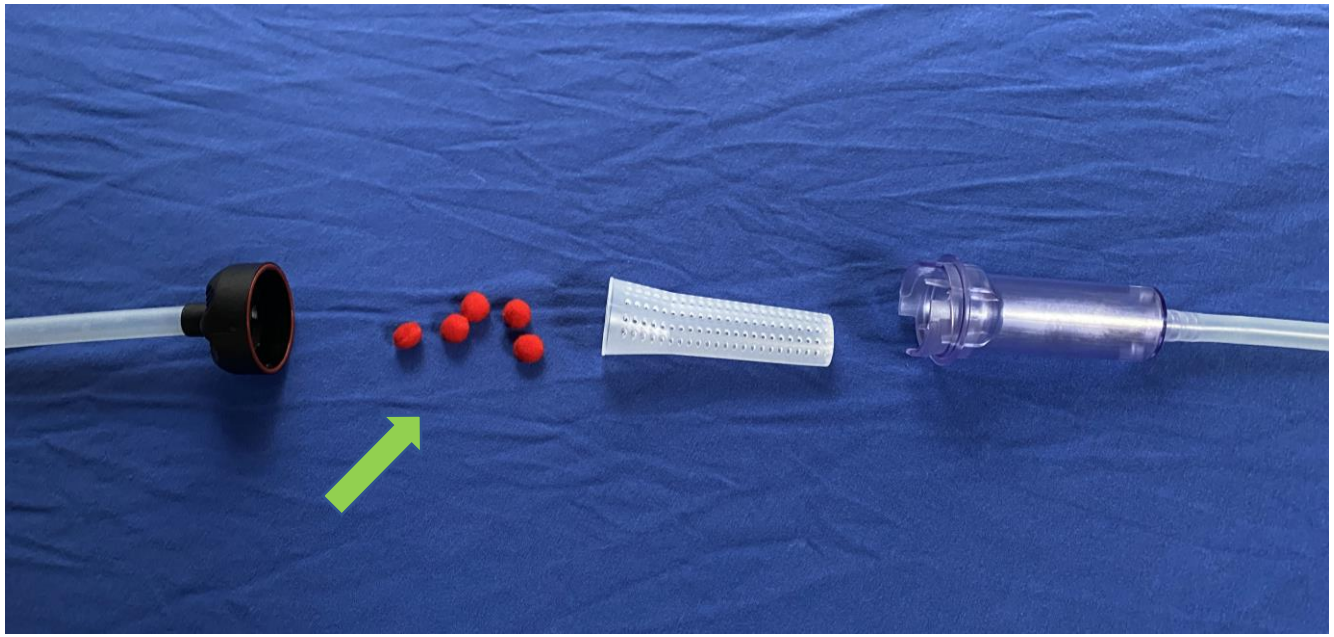
Bone Collector

The collector can be opened by turning the two outer components counterclockwise



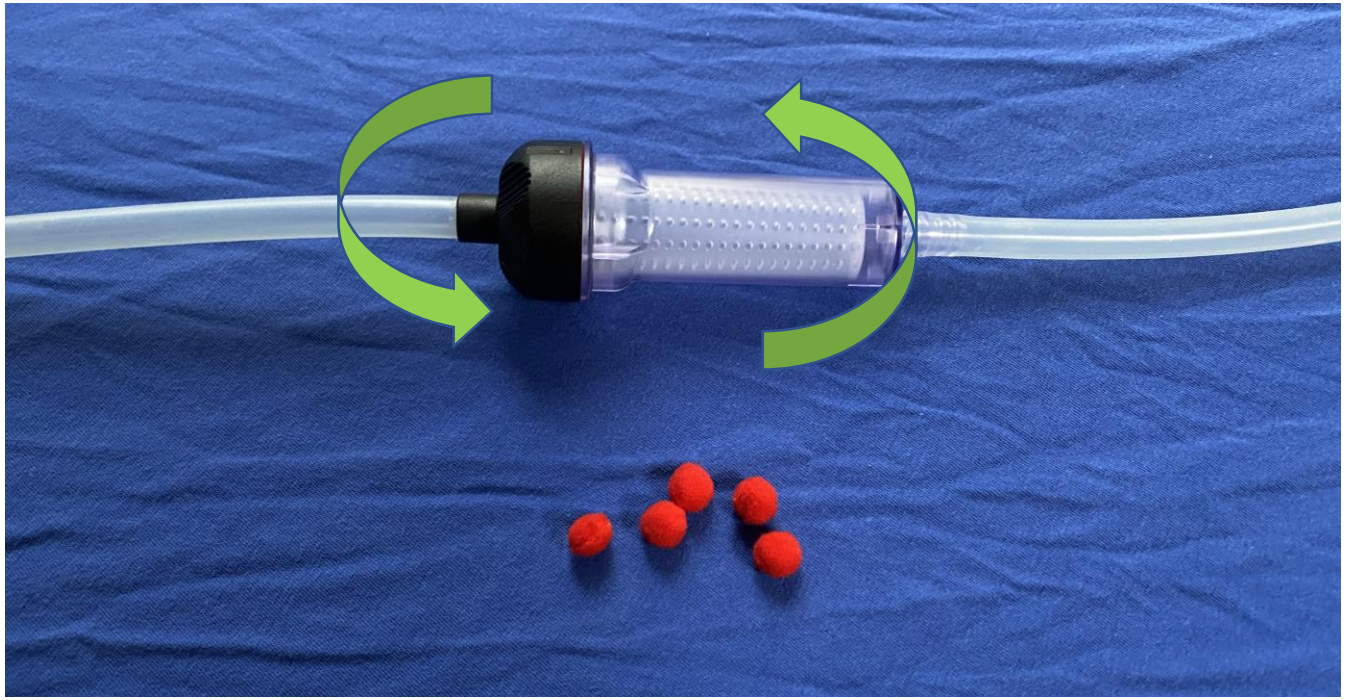
Bone Collector

The collected soft tissue and bone material can now be removed from the collection basket



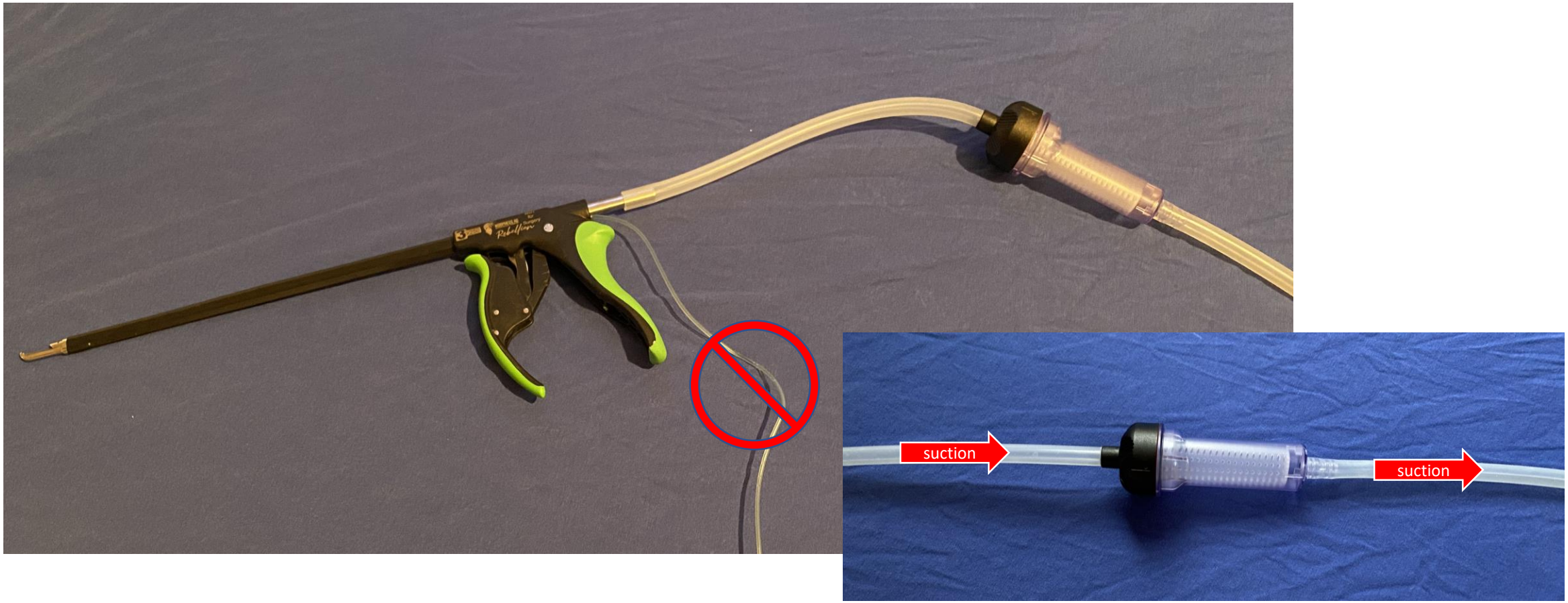
Bone Collector

After the bone material has been removed from the collection basket, the bone collector can be closed again in a clockwise direction.



Bone Collector

The surgery can now be continued or ended



Rebellion

PD Dr. Carsten Stüer - Wirbelwerk Hamburg, Germany

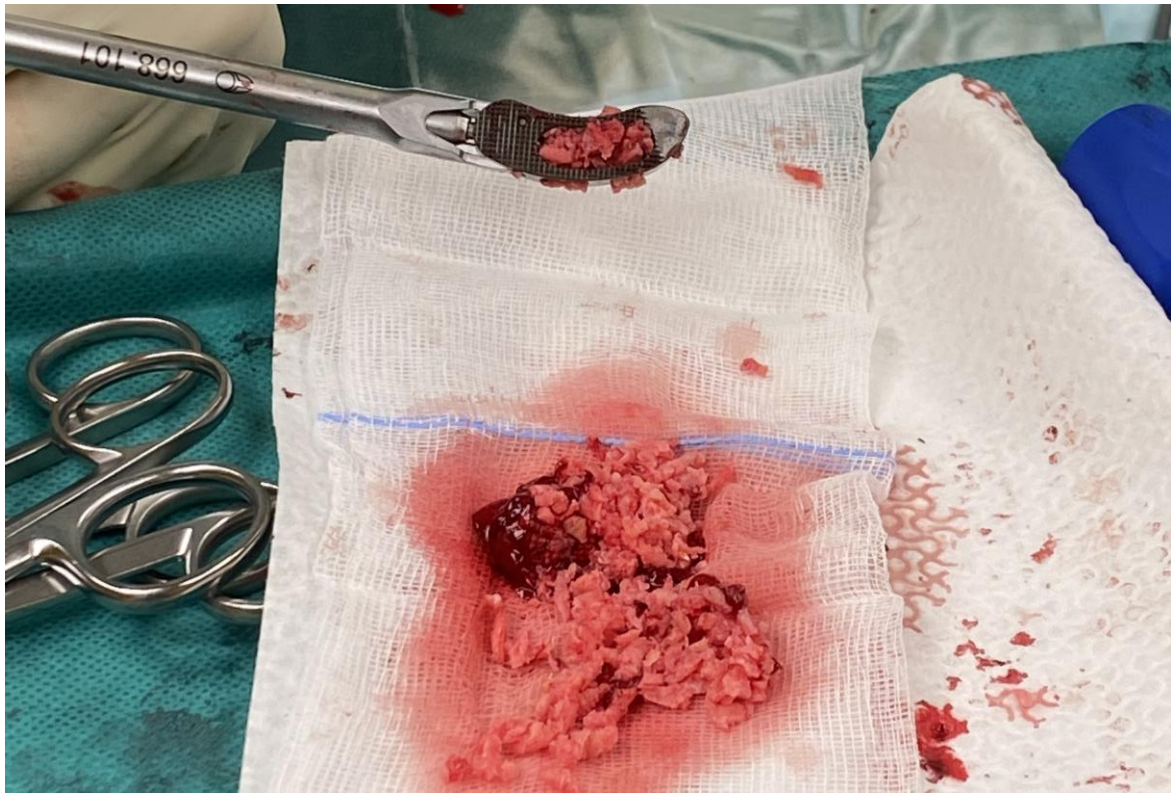
1. „In a ninety minute case I save 20 minutes.“

Prof. Dr. Henry Halm - Schön Clinik Neustadt i.H., Germany

1. „With the Rebellion punch I can work more precisely, because it cuts the bone and does not punch it.“
2. „Preparation of the bone is faster, because I do not have to leave the surgical field to hand over the bone to the nurse.”
3. “Rebellion is always sharp, therefore no delay or difficulties during surgery. We checked our normal Kerrison punches and most of them are already blunt after a few surgeries.”

Prof. Dr. Jürgen Harms - ETHIANUM Klinik Heidelberg, Germany

1. „In a two-hour surgery it saves 30 minutes.“
2. „It is excellent for tumor surgery because the tumor parts are sucked through the punch into collector and there is no risk that tumor material might drop somewhere in the surgical area.”
3. “The quality of the collected bone is much better than from a standard Kerrison punch.”
4. “It is less stress on my hand and I can do more surgeries and operate faster because I feel no pain.”



First observations

- 1. All surgeons were amazed by the precision of the cutting.
- 2. The handling was optimal, only in some surgeries the shaft was too long.
- 3. Quality of the punched and collected bone was rated excellent.
- 4. The operating room staff was impressed by the simplicity of the rebellion - bone collection was rated as very positive.

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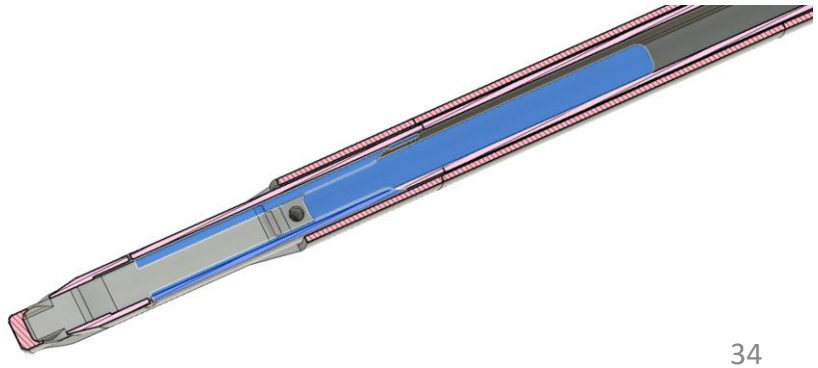
Updates

The Rebellion „BoneBlade“

The following improvement has been made:

1. Guiding wings (blue) within the tip were cut so bone and ligament are transported more easily.
2. With the new version we increased the thickness of the upper jaw to avoid potential bending.
3. In addition we added a further step by electropolishing the tube and the jaws to reduce friction as much as possible.
4. We plan a third length (160mm) in Q2 2023
5. The elimination of the irrigation Q4 2022 (Test phase has ended)



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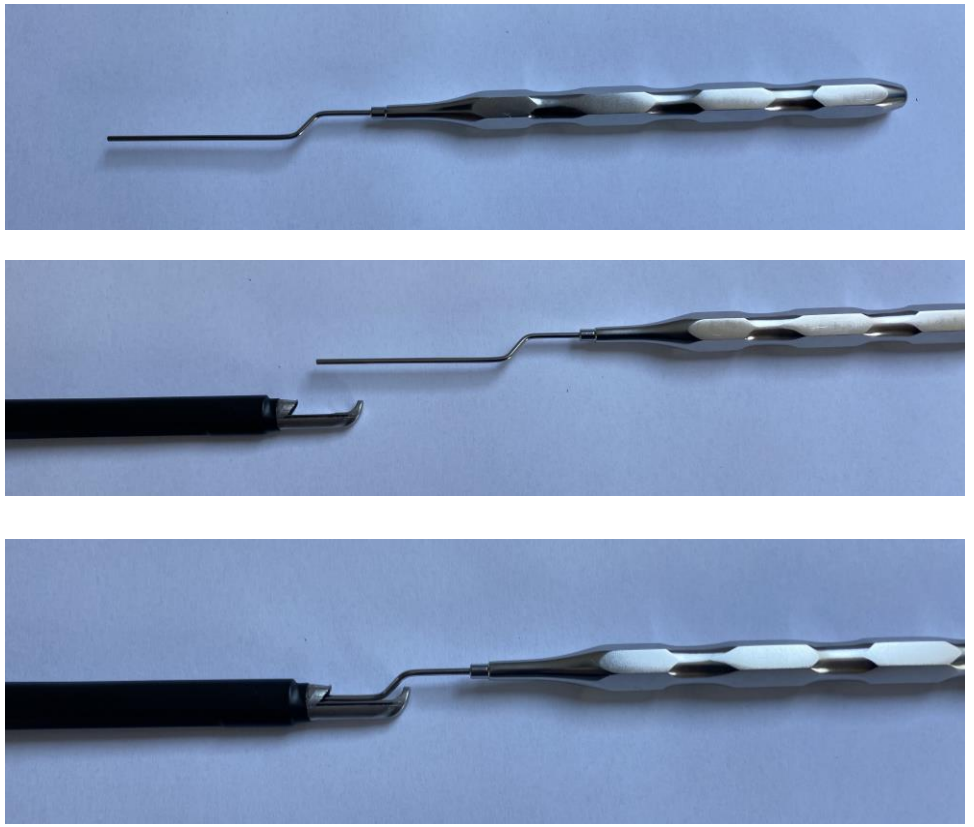
The Rebellion „Pusher“ Instrument

The Rebellion Pusher has a bayonet tip that makes it very easy to remove large wedged pieces of bone.

To do this, please put the pusher in the jaw and push the material from front to back.

The jaw is the narrowest point of the Rebellion – the tube is conically shaped and widens along the shaft to the back.



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Rebellion – Troubleshooting!

Rebellion – Troubleshooting!

The Rebellion does not suck!

- **Is the suction unit connected correctly and does the suction work?**
- **Check if there is a leak within the system – between the Rebellion and the Bone Collector – between the Bone Collector and the suction unit**
- **Is the suction unit strong enough? (0.8 bar and 40-50l / min.)**
- **Please don´t share the suction with the neurosuction!**
- **Is the punch possibly blocked?**
- **Is the suction tube kinked?**
- **Bone-Collector full?**

The handle is blocked and must be "opened" again manually!

- **A large piece of bone (or a lot of soft tissue) has stuck at the front of the "mouth" - push it from front to back with a suitable object (the Pusher, K-wire, narrow tweezers, etc.)! (not from back to front - the lumen is the smallest at the front)**

- **Could be first sign that the Rebellion clogged!**

Rebellion – Troubleshooting!

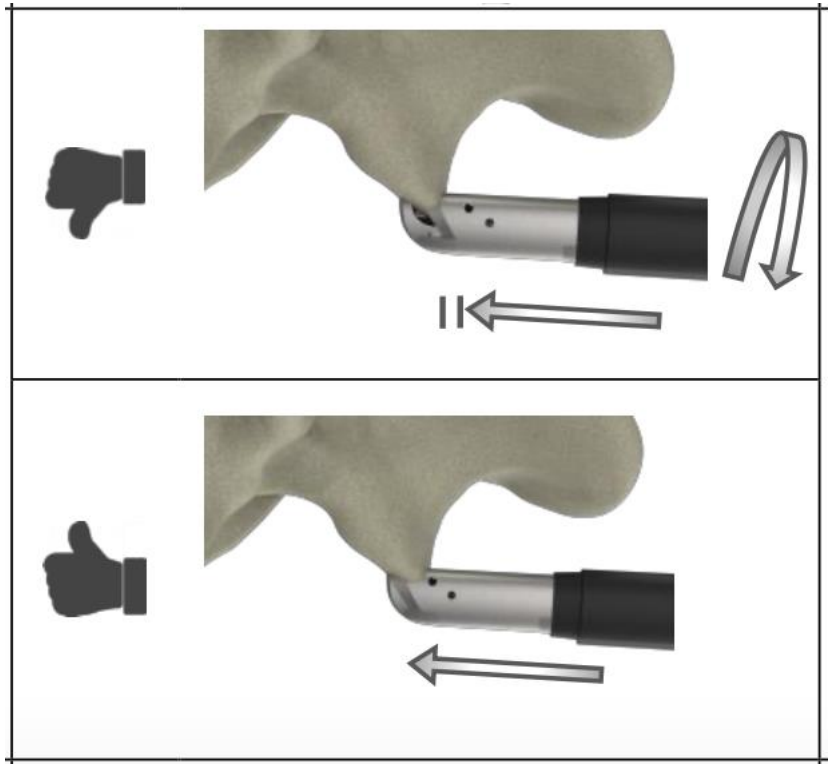
The punch is blocked!

- **Use a K-wire or a similar instrument to push the material from front to back (see above).**
- **Possibly inject with a syringe (with cannula) to clean the shaft.**
- **Possibly soak up water (from a bowle) to rinse the shaft.**

- **When a lot of soft tissue has been punched, flush Rebellion and clean the mouth.**
- **Really "punch through" and do not tear off or do not turn the Rebellion half closed!**
- **It is generally recommended that the nurse checks the punch (tube, jaw, etc.) during the whole surgery!**

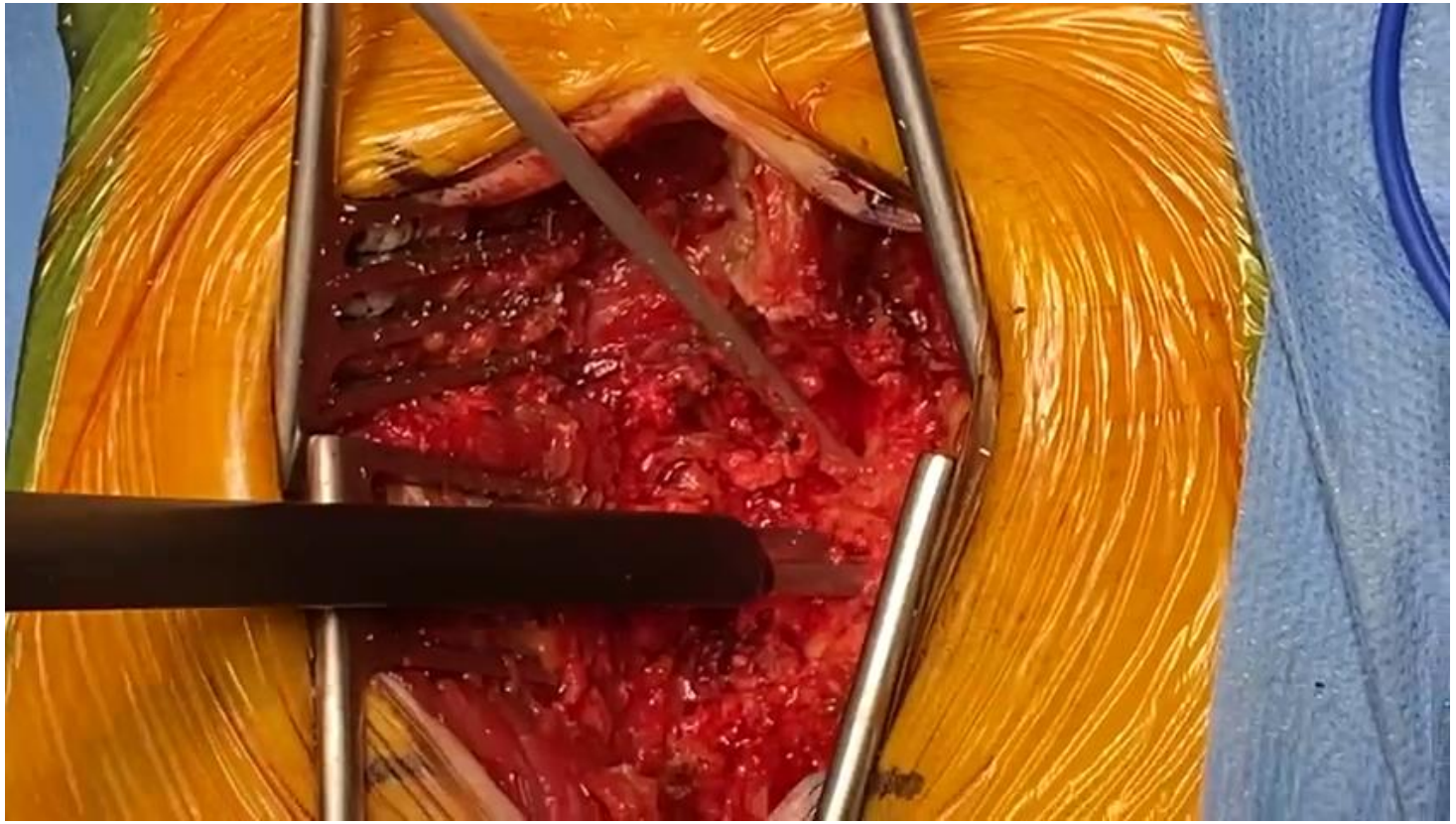
Rebellion – Troubleshooting!

In order to achieve an optimal result, the bone has to be completely punched through - don´t twist or tear off the tissue or the bone during the punching or cutting process.



Rebellion – Troubleshooting!

How it works!



Rebellion – Trouebleshooting!

Use the pusher!

Use the pusher!

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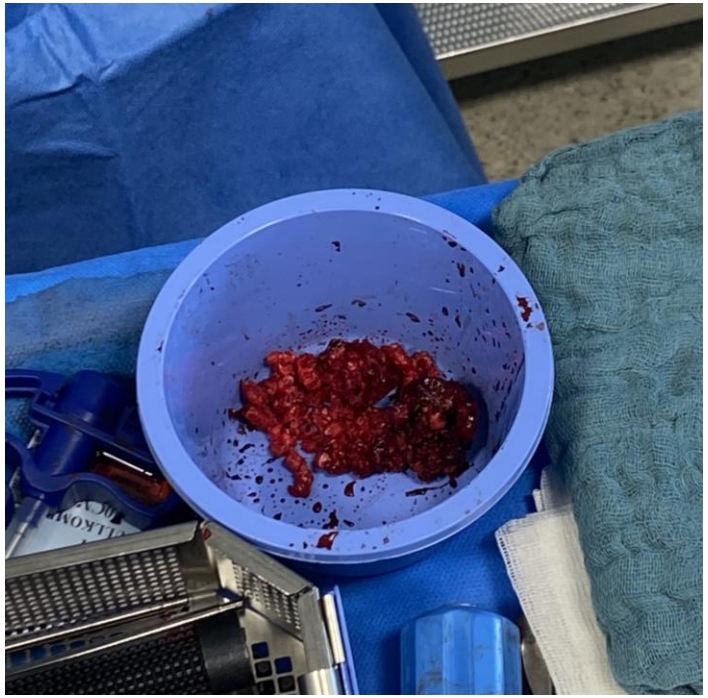
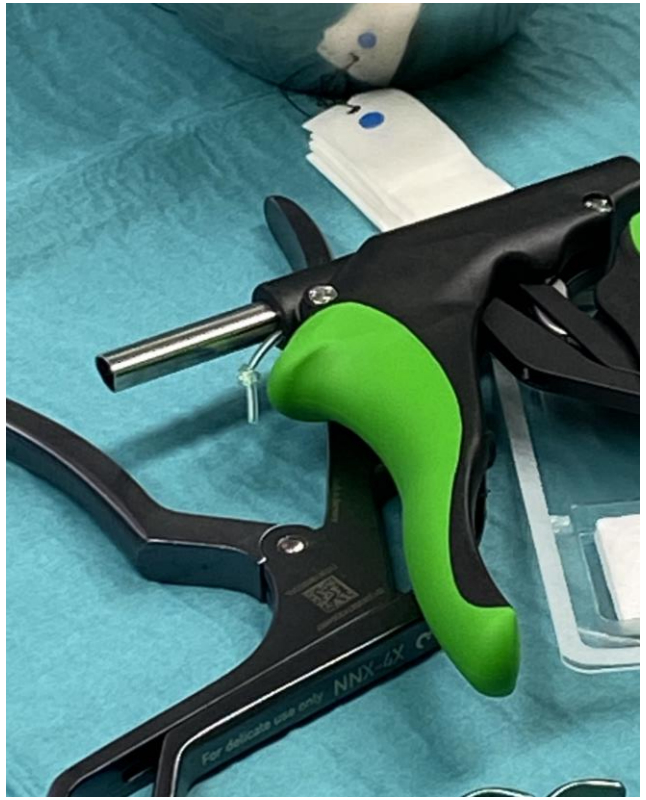
Rebellion

Test Phase without irrigation/rinsing solution





Rebellion

Dura preparation from Th12 to L5 with the Rebellion.

Univ.-Prof. Dr. med.
REZA AKHAVAN-SIGARI

BREMEN / GERMANY

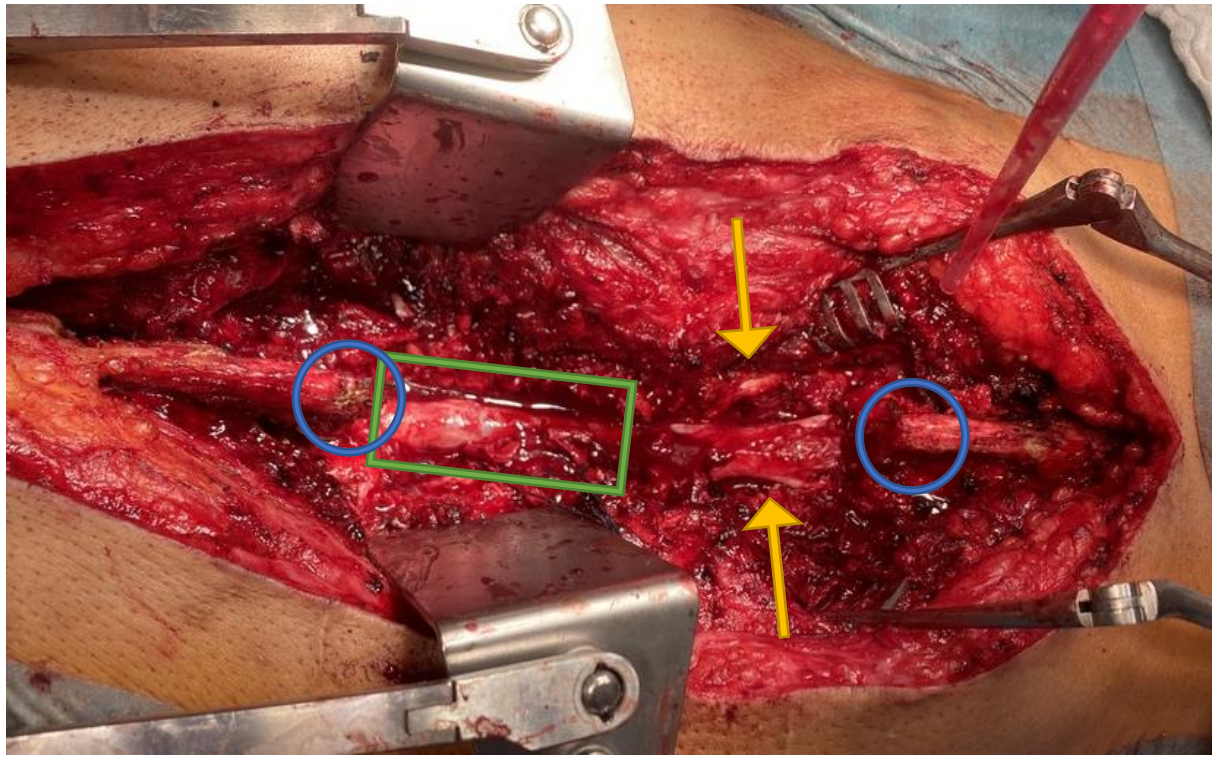
Blue: Spinous process Th12 – L5

Green: Dura

Yellow: Nerve roots L3

Time saving: 30 min.

Work was more precisely and with less pain in the surgeons hand!



Rebellion

After the first Rebellion surgery!

Prof. Dr. med. habil.
Jörg Franke

MAGDEBURG / GERMANY

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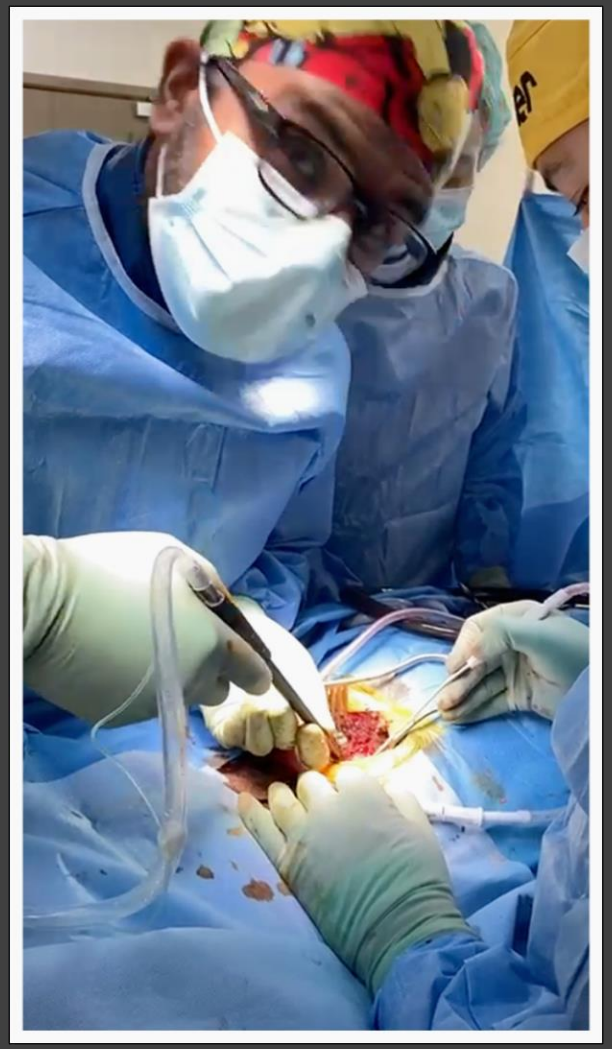

Thank you for your attention!